

Title (en)
REPROGRAMMING OF SOMATIC CELLS

Title (de)
NEUPROGRAMMIERUNG VON KÖRPERZELLEN

Title (fr)
REPROGRAMMATION DE CELLULES SOMATIQUES

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Abstract (en)
The disclosure relates to a method of reprogramming one or more somatic cells, e.g., partially differentiated or fully/terminally differentiated somatic cells, to a less differentiated state, e.g., a pluripotent or multipotent state. In further embodiments the invention also relates to reprogrammed somatic cells produced by methods of the invention, to uses of said cells, and to methods for identifying agents useful for reprogramming somatic cells.

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Citation (applicant)

- US 6995011 B2 20060207 - ITOH AKIRA [JP], et al
- US 2006148104 A1 20060706 - MARINI DAVIDE [US], et al
- WO 2005085196 A2 20050915 - DKFZ [DE], et al
- WO 2007007054 A1 20070118 - CANCER REC TECH LTD [GB], et al
- US 5646008 A 19970708 - THOMPSON CRAIG B [US], et al
- US 4846835 A 19890711 - GRANDE DANIEL A [US]
- US 4642120 A 19870210 - NEVO ZVI [IL], et al
- US 5786217 A 19980728 - TUBO ROSS A [US], et al
- US 5041138 A 19910820 - VACANTI JOSEPH P [US], et al
- US 5698446 A 19971216 - KLUMP WOLFGANG M [US], et al
- US 6761884 B1 20040713 - BLAESE MICHAEL [US], et al
- US 5487992 A 19960130 - CAPECCHI MARIO R [US], et al
- US 5627059 A 19970506 - CAPECCHI MARIO R [US], et al
- US 5631153 A 19970520 - CAPECCHI MARIO R [US], et al
- US 6204061 B1 20010320 - CAPECCHI MARIO R [US], et al
- US 60525612 P
- US 60530042 P
- US 60922121 P
- US 99714604 A 20041124
- BRAMBRINK, T. ET AL., PROC NATL ACAD SCI USA, vol. 103, no. 14, 2006, pages 7963 - 2000
- MITSUI, K. ET AL., CELL, vol. 113, no. 5, 2003, pages 631 - 655
- AVNER, P. HEARD, E., NATURE REVIEWS GENETICS, vol. 2, 2001, pages 59 - 67
- EGGAN, K. ET AL., SCIENCE, vol. 290, no. 5496, 2000, pages 1578 - 81
- PHILOS, TRANS R SOC LOND B BIOL SCI, vol. 358, no. 1436, 29 August 2003 (2003-08-29), pages 1397 - 402
- THOMSON ET AL., SCIENCE, vol. 5854, 23 November 2007 (2007-11-23), pages 1224 - 1225
- PEASE ET AL., DEV., vol. 141, 1990, pages 322 - 352
- BRINSTER ET AL., NATURE, vol. 296, 1982, pages 39 - 42
- LEE ET AL., P.N.A.S. USA, vol. 85, 1988, pages 1204 - 1208
- KLOCK ET AL., NATURE, vol. 329, 1987, pages 734 - 736
- ISRAELKAUFMAN, NUCLEIC ACIDS RES, vol. 17, 1989, pages 2589 - 2604
- NICHOLS ET AL., CELL, vol. 95, 1998, pages 379 - 391
- NIWA ET AL., NATURE GENET, vol. 24, 2000, pages 372 - 376
- IMAMURA ET AL., BMC DEVELOPMENTAL BIOLOGY, vol. 6, 2006, pages 34
- BORTVIN ET AL., DEVELOPMENT, vol. 130, no. 8, 2003, pages 1673 - 80
- HOCHEDLINGER, K. JAENISCH, R.: "Monoclonal mice generated by nuclear transfer from mature B and T donor cells", NATURE, vol. 415, no. 6895, 2002, pages 1035 - 1038, XP002978799, DOI: 10.1038/nature718
- SOLTERKNOWLES, PROC. NATL. ACAD. SCI. USA, vol. 75, 1978, pages 5565 - 5569
- KANNAGI ET AL., EMBO J, vol. 2, 1983, pages 2355 - 2361
- WOBUS ET AL., EXP. CELL, vol. 152, pages 212 - 219
- LENDAHL ET AL., CELL, vol. 60, 1990, pages 585 - 595

- DAH-ISTRAND ET AL., J. CELL SCI., vol. 103, 1992, pages 589 - 597
- WEIGMANN ET AL., PROC. NATL. ACAD. USA, vol. 94, 1997, pages 12425 - 12430
- CORBEIL ET AL., BLOOD, vol. 91, 1998, pages 2625 - 22626
- WALSH, C.P. ET AL., NAT. GENET., vol. 20, no. 2, 1998, pages 116 - 383
- LEE ET AL., J. BIOL. CHEM., vol. 274, 1999, pages 1566 - 1572
- DUPREY ET AL., GENES DEV, vol. 2, 1988, pages 1647 - 1654
- SUBRAMANIA'N ET AL., DIFFERENTIATION, vol. 64, 1998, pages 11 - 18
- GINIS, I. ET AL., DEV. BIOL., vol. 269, 2004, pages 369 - 380
- RAMALHO-SANTOS ET AL., SCIENCE, vol. 298, 2002, pages 597 - 600
- IVANOVA ET AL., SCIENCE, vol. 260, 1993, pages 926 - 932
- GOLL, GBESTOR, T., ANNU REV. BIOCHEMISTRY, vol. 74, 2005, pages 481 - 514
- OKANO, M. ET AL., CELL, vol. 99, no. 3, 1999, pages 247 - 57
- JAGLA, B. ET AL., RNA, vol. 11, no. 6, 2005, pages 864 - 72
- HARRIS, S.LEVINE, A, ONCOGENE, vol. 24, 2005, pages 2899 - 2908
- URLINGER ET AL., PROC NATL ACAD SCI USA, vol. 97, no. 14, 2000, pages 7963
- LYKO, F.BROWN, R., JNCI JOURNAL OF THE NATIONAL CANCER INSTITUTE, vol. 97, no. 20, 2005, pages 1498 - 1506
- PINA, I.C., J ORG CHEM., vol. 68, no. 10, 2003, pages 3866 - 73
- YANG, A.S. ET AL., NUCL. ACIDS RES., vol. 32, no. 3, 2004, pages e38
- ATALA, CURR. OPIN. UROL., vol. 9, no. 6, 1999, pages 517 - 526
- AVILION, J. ET AL., NAT. BIOTECHNOL., vol. 20, 2003, pages 1240 - 45
- "Gene Targeting: A Practical Approach", 1993, IRL PRESS AT OXFORD UNIVERSITY PRESS
- PALACIOS ET AL., PROC. NATL. ACAD. SCI., USA, vol. 92, 1995, pages 7530 - 37
- PEDERSEN, J, REPROD. FERTIL. DEV., vol. 6, 1994, pages 543 - 52
- BAIN ET AL., DEV. BIOL., vol. 168, 1995, pages 342 - 357
- YOSHIMOTO ET AL., BRAIN RESEARCH, vol. 691, 1995, pages 25 - 36
- LUNDBERG ET AL., DEVELOP. NEUROL., vol. 139, 1996, pages 39 - 53
- HOCHEDLINGER ET AL.: "Core transcriptional regulatory circuitry in human embryonic stem cells", CELL, vol. 122, no. 3, 2005, pages 947 - 956, XP002412923, DOI: 10.1016/j.cell.2005.08.020
- NAVIAUX, R.K. ET AL.: "The pCL vector system: rapid production of helper-free, high-titer, recombinant retroviruses", J VIROL, vol. 70, no. 8, 1996, pages 5701 - 5705
- CHAPMAN, V. ET AL., NATURE, vol. 284, 1984
- WALSH ET AL., NAT GENET, vol. 20, no. 2, 1998, pages 116
- BLELLOCH ET AL., STEM CELLS, vol. 24, no. 9, 2006, pages 2007
- LUCIFERO, D. ET AL., GENOMICS, vol. 79, no. 4, 2002, pages 530
- HOCHEDLINGER, K.JAENISCH, R.: "Nuclear reprogramming and pluripotency", NATURE, vol. 441, no. 7097, 2006, pages 1061 - 1067
- WERNIG ET AL., J. NEUROSCI, vol. 24, no. 22, 2004, pages 5258
- LABOSKY, P.A. ET AL., DEVELOPMENT, vol. 120, no. 11, 1994, pages 3197
- BOYER ET AL., NAT GENET, vol. 38, no. 4, 2006, pages 431
- BERNSTEIN, B.E. ET AL.: "A bivalent chromatin structure marks key developmental genes in embryonic stem cells", CELL, vol. 125, no. 4, 2006, pages 315 - 326
- AZUARA, V. ET AL., NAT CELL BIOL, vol. 8, no. 5, 2006, pages 532
- VENTURA, A. ET AL., PROC NATL ACAD SCI USA, vol. 101, no. 28, 2004, pages 10380
- HOLM, T.M. ET AL., CANCER CELL, vol. 8, no. 4, 2005, pages 275
- YAMANAKA, STEM CELLS, vol. 1, 2007, pages 39 - 49
- EGGAN ET AL., PROC NATL ACAD SCI USA, vol. 98, 2001, pages 6209 - 6214
- ALT, F. ET AL.: "Organization and reorganization of immunoglobulin genes in A-MULV-transformed cells: rearrangement of heavy but not light chain genes", CELL, vol. 27, 1981, pages 381 - 390, XP023912794, DOI: 10.1016/0092-8674(81)90421-9
- AOI, T. ET AL.: "Science", 2008, SCIENCE ONLINE EXPRESS, article "Generation of Pluripotent Stem Cells from Adult Mouse Liver and Stomach Cells"
- BLELLOCH, R. ET AL.: "Reprogramming efficiency following somatic cell nuclear transfer is influenced by the differentiation and methylation state of the donor nucleus", STEM CELLS (DAYTON, OHIO, vol. 24, 2006, pages 2007 - 2013, XP055444565, DOI: 10.1634/stemcells.2006-0050
- BRAMBRINK, T. ET AL.: "Sequential Expression of Pluripotency Markers during Direct Reprogramming of Mouse Somatic Cells", CELL STEM CELL, vol. 2, 2008, pages 151 - 159, XP002560041, DOI: 10.1016/j.stem.2008.01.004
- BYRNE, J.A. ET AL.: "Producing primate embryonic stem cells by somatic cell nuclear transfer", NATURE, vol. 450, 2007, pages 497 - 502, XP055291662, DOI: 10.1038/nature06357
- CHANG, Y. ET AL.: "Enumeration and characterization of DJH structures in mouse fetal liver", THE EMBO JOURNAL, vol. 11, 1992, pages 1891 - 1899
- COBALEDA, C. ET AL.: "Conversion of mature B cells into T cells by dedifferentiation to uncommitted progenitors", NATURE, vol. 449, 2007, pages 473 - 477, XP055291303, DOI: 10.1038/nature06159
- COBALEDA, C. ET AL.: "Pax5: the guardian of B cell identity and function", NATURE IMMUNOLOGY, vol. 8, 2007, pages 463 - 470, XP055767765, DOI: 10.1038/nri1454
- COWAN, C.A. ET AL.: "Nuclear reprogramming of somatic cells after fusion with human embryonic stem cells", SCIENCE, vol. 309, 2005, pages 1369 - 1373, XP002425303, DOI: 10.1126/science.1116447
- EADS, C.A.P. W. LAIRD, METHODS MOL BIOL, vol. 200, 2002, pages 71
- EGGAN, K. ET AL.: "Hybrid vigor, fetal overgrowth, and viability of mice derived by nuclear cloning and tetraploid embryo complementation", PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES OF THE UNITED STATES OF AMERICA, vol. 98, 2001, pages 6209 - 6214, XP002206043, DOI: 10.1073/pnas.101118898
- EGGAN, K. ET AL.: "Mice cloned from olfactory sensory neurons", NATURE, vol. 428, 2004, pages 44 - 49, XP002526874, DOI: 10.1038/nature02375
- GOSSEN M ET AL.: "Transcriptional activation by tetracyclines. in mammalian cells", SCIENCE, vol. 268, 1995, pages 1766 - 1769, XP000606285, DOI: 10.1126/science.7792603
- GROMPE, M: "The origin of hepatocytes", GASTROENTEROLOGY, vol. 128, 2005, pages 2158 - 2160, XP005313931, DOI: 10.1053/j.gastro.2005.04.022
- GURDON, J.B.: "From nuclear transfer to nuclear reprogramming: the reversal of cell differentiation", ANNUAL REVIEW OF CELL AND DEVELOPMENTAL BIOLOGY, vol. 22, 2006, pages 1 - 22
- HANNA, J. ET AL.: "Treatment of sickle cell anemia mouse model with iPS cells generated from autologous skin", SCIENCE, vol. 318, 2007, pages 1920 - 1923, XP055556926, DOI: 10.1126/science.1152092
- HANNA, L.A. ET AL., GENES DEV, vol. 16, 2002, pages 2650 - 61
- HAYASHI, E.A. ET AL.: "Role of TLR in B cell development: signaling through TLR4 promotes B cell maturation and is inhibited by TLR2", J IMMUNOL, vol. 174, 2005, pages 6639 - 6647
- HOCHEDLINGER, K. ET AL., CELL, vol. 121, no. 3, 2005, pages 465
- IHLE, J. H., CELL, vol. 84, 1996, pages 331 - 334

- INOUE, K. ET AL.: "Generation of cloned mice by direct nuclear transfer from natural killer T cells", *CURR BIOL*, vol. 15, 2005, pages 1114 - 1118, XP025346430, DOI: 10.1016/j.cub.2005.05.021
- JAENISCH, R. YOUNG: "Stem Cells, the Molecular Circuitry of Pluripotency and Nuclear Reprogramming", *CELL*, vol. 132, 2008, XP009114628, DOI: 10.1016/j.cell.2008.01.015
- JAENISCH, R., *N ENGL J MED*, vol. 351, no. 27, 2004, pages 2787
- JACKSON-GRUSBY, L. ET AL., *NAT. GENET.*, vol. 27, no. 1, 2001, pages 31
- JUNG, D. ET AL.: "Mechanism and control of V(D)J recombination at the immunoglobulin heavy chain locus", *ANNUAL REVIEW OF IMMUNOLOGY*, vol. 24, 2006, pages 541 - 570, XP002473551, DOI: 10.1146/annurev.immunol.23.021704.115830
- LAIOSA, C.V. ET AL.: "Reprogramming of committed T cell progenitors to macrophages and dendritic cells by C/EBP alpha and PU.1 transcription factors", *IMMUNITY*, vol. 25, 2006, pages 731 - 744
- TAKAHASHI, K. YAMANAKA, S.: "Induction of pluripotent stem cells from mouse embryonic and adult fibroblast cultures by defined factors", *CELL*, vol. 126, no. 2, 2006, pages 663 - 676
- LENGNER, C. ET AL.: "Oct4 is dispensable for somatic stem cell self-renewal", *CELL STEM CELLS SUBMITTED*, 2007
- LEWIS, S. ET AL.: "Continuing kappa-gene rearrangement in a cell line transformed by Abelson murine leukemia virus", *CELL*, vol. 30, 1982, pages 807 - 816, XP023911292, DOI: 10.1016/0092-8674(82)90285-9
- LI, E. ET AL., *CELL*, vol. 69, 1992, pages 915
- LI, J. ET AL.: "Mice cloned from skin cells", *PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES OF THE UNITED STATES OF AMERICA*, vol. 104, 2007, pages 2738 - 2743
- LI, J. ET AL.: "Odorant receptor gene choice is reset by nuclear transfer from mouse olfactory sensory neurons", *NATURE*, vol. 428, 2004, pages 393 - 399
- LOH, Y.H. ET AL.: "The Oct4 and Nanog transcription network regulates pluripotency in mouse embryonic stem cells", *NATURE GENETICS*, vol. 38, 2006, pages 431 - 440, XP055040177, DOI: 10.1038/ng1760
- MAHERALI, N. ET AL.: "Directly Reprogrammed Fibroblasts Show Global Epigenetic Remodeling and Widespread Tissue Contribution", *CELL STEM CELLS*, vol. 1, 2007, pages 55 - 70, XP009091847, DOI: 10.1016/j.stem.2007.05.014
- MAHERALI, N. ET AL.: "Global epigenetic remodeling in directly reprogrammed fibroblasts", *CELL STEM CELLS*, 2007
- MATTHEWS, V.B. ET AL.: "Genetic manipulations utilizing albumin and alpha-fetoprotein promoter/enhancers affect both hepatocytes and oval cells", *HEPATOLOGY*, vol. 40, 2004, pages 759 - 760
- MATTHIAS, P. ROLINK, A.G.: "Transcriptional networks in developing and mature B cells", *NATURE REVIEWS*, vol. 5, 2005, pages 497 - 508
- MEISSNER, A. ET AL.: "Direct reprogramming of genetically unmodified fibroblasts into pluripotent stem cells", *NATURE BIOTECHNOLOGY*, vol. 25, 2007, pages 1177 - 1181, XP002478583, DOI: 10.1038/nbt1335
- MEISSNER, A. ET AL., *NUCLEIC ACIDS RES*, vol. 33, no. 18, 2005, pages 5868
- MILNE, C.D. ET AL.: "IL-7 does not prevent pro-B/pre-B cell maturation to the immature/slgM(+) stage", *EUROPEAN JOURNAL OF IMMUNOLOGY*, vol. 34, 2004, pages 2647 - 2655
- MUNSIE M.J. ET AL., *CURR. BIOL.*, vol. 10, 2000, pages 989
- NADEL, B. ET AL.: "Murine lambda gene rearrangements: the stochastic model prevails over the ordered model", *THE EMBO JOURNAL*, vol. 9, 1990, pages 435 - 440
- NAKAGAWA, M. ET AL.: "Generation of induced pluripotent stem cells without Myc from mouse and human fibroblasts", *NATURE BIOTECHNOLOGY*, vol. 26, 2008, pages 101 - 106, XP008153586, DOI: 10.1038/nbt1374
- OBERDOERFFER, P. ET AL.: "Expression of a targeted lambda 1 light chain gene is developmentally regulated and independent of Ig kappa rearrangements", *THE JOURNAL OF EXPERIMENTAL MEDICINE*, vol. 197, 2003, pages 1165 - 1172
- OKITA, K. ET AL.: "Generation of germline-competent induced pluripotent stem cells", *NATURE*, vol. 448, 2007, pages 313 - 317, XP055637413, DOI: 10.1038/nature05934
- PAPAVALIOU, F. ET AL.: "V(D)J recombination in mature B cells: a mechanism for altering antibody responses", *SCIENCE*, vol. 278, 1997, pages 298 - 301
- PARK, I.H. ET AL.: "Reprogramming of human somatic cells to pluripotency with defined factors", *NATURE*, vol. 451, 2008, pages 141 - 146
- PEITZ, M. ET AL., *PROC NATL ACAD SCI U S A*, vol. 99, no. 7, 2002, pages 4489
- POSTIC, C. ET AL.: "Dual roles for glucokinase in glucose homeostasis as determined by liver and pancreatic beta cell-specific gene knock-outs using Cre recombinase", *THE JOURNAL OF BIOLOGICAL CHEMISTRY*, vol. 274, 1999, pages 305 - 315, XP002972165, DOI: 10.1074/jbc.274.1.305
- RAMJI, D.P. FOKA, P.: "CCAAT/enhancer-binding proteins: structure, function and regulation", *THE BIOCHEMICAL JOURNAL*, vol. 365, 2002, pages 561 - 575
- ROUNTREE, C.B. ET AL.: "A CD133-expressing murine liver oval cell population with bilineage potential", *STEM CELLS (DAYTON, OHIO)*, vol. 25, 2007, pages 2419 - 2429
- SCHLISSEL, M.S.: "Regulating antigen-receptor gene assembly", *NATURE REVIEWS*, vol. 3, 2003, pages 890 - 899
- SCHLISSEL, M.S. ET AL.: "Virus-transformed pre-B cells show ordered activation but not inactivation of immunoglobulin gene rearrangement and transcription", *THE JOURNAL OF EXPERIMENTAL MEDICINE*, vol. 173, 1991, pages 711 - 720
- SHMBLOTT, M.J. ET AL.: "Derivation of pluripotent stem cells from cultured human primordial germ cells", *PROC. NATL. ACAD. SCI. USA*, vol. 95, 1998, pages 13726 - 13731
- WILLIAM R.L. ET AL., *NATURE*, vol. 336, 1988, pages 684 - 687
- STADTFELD, M. ET AL.: "Defining Molecular Cornerstones during Fibroblast to iPS Cell Reprogramming in Mouse", *CELL STEM CELL ADVANCE ONLINE PUBLICATION*, 2008
- TADA, M. ET AL.: "Nuclear reprogramming of somatic cells by in vitro hybridization with ES cells", *CURR BIOL*, vol. 11, 2001, pages 1553 - 1558, XP002960228, DOI: 10.1016/S0960-9822(01)00459-6
- TAKAHASHI, K. ET AL.: "Induction of pluripotent stem cells from adult human fibroblasts by defined factors", *CELL*, vol. 131, 2007, pages 861 - 872, XP055547222, DOI: 10.1016/j.cell.2007.11.019
- TAN, D.S. ET AL., *J. AM. CHEM. SOC.*, vol. 120, 1998, pages 8565 - 8566
- TENG, G. PAPAVALIOU, F.N.: "Immunoglobulin somatic hypermutation", *ANNUAL REVIEW OF GENETICS*, vol. 41, 2007, pages 107 - 120
- THOMSON, J.A. ET AL.: "Embryonic stem cell lines derived from human blastocysts", *SCIENCE*, vol. 282, 1998, pages 1145 - 1147, XP002933311, DOI: 10.1126/science.282.5391.1145
- URLINGER S. ET AL., *PROC. NATL. ACAD. SCI. USA.*, vol. 97, no. 14, 2000, pages 7963 - 8
- WAKAYAMA, T. YANAGIMACHI, R.: "Mouse cloning with nucleus donor cells of different age and type", *MOLECULAR REPRODUCTION AND DEVELOPMENT*, vol. 58, 2001, pages 376 - 383
- WANG, X. ET AL.: "The origin and liver repopulating capacity of murine oval cells", *PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES OF THE UNITED STATES OF AMERICA*, vol. 100, 2003, pages 11881 - 11888
- WANG, Z. JAENISCH, R.: "At most three ES cells contribute to the somatic lineages of chimeric mice and of mice produced by ES-tetraploid complementation", *DEV BIOL*, vol. 275, 2004, pages 192 - 201, XP004583568, DOI: 10.1016/j.ydbio.2004.06.026
- WERNIG, M. ET AL.: "In vitro reprogramming of fibroblasts into a pluripotent ES-cell-like state", *NATURE*, vol. 448, 2007, pages 318 - 324, XP002621304, DOI: 10.1038/NATURE05944
- WERNIG, M.A. ET AL.: "c-Myc Is Dispensable for Direct Reprogramming of Mouse Fibroblasts", *CELL STEM CELL*, vol. 2, 2008, pages 10 - 12, XP009098390
- WERNIG, M. ET AL., *J NEUROSCI*, vol. 24, no. 22, 2004, pages 5258
- WILMUT, I. ET AL.: "Viable offspring derived from fetal and adult mammalian cells", *NATURE*, vol. 385, 1997, pages 810 - 813, XP002067035, DOI: 10.1038/385810a0

- XIE, H. ET AL.: "Stepwise reprogramming of B cells into macrophages", CELL, vol. 117, 2004, pages 663 - 676, XP055728800, DOI: 10.1016/S0092-8674(04)00419-2
- YAMADA, Y. ET AL.: "Regulation of the collagen II gene in vitro and in transgenic mice", ANN. NEW YORK ACAD. SCI., vol. 580, 1990, pages 81 - 87
- YAMANAKA, S: "Strategies and New Developments in the Generation of Patient-Specific Pluripotent Stem Cells", CELL STEM CELLS, vol. 1, 2007, pages 39 - 49, XP002520334, DOI: 10.1016/j.stem.2007.05.012
- YANG, X ET AL.: "Nuclear reprogramming of cloned embryos and its implications for therapeutic cloning", NAT GENET, vol. 39, 2007, pages 295 - 302
- YU, J. ET AL.: "Induced pluripotent stem cell lines derived from human somatic cells", SCIENCE, vol. 318, 2007, pages 1917 - 1920, XP055435356, DOI: 10.1126/science.1151526
- ZAMBROWICZ B.P. ET AL.: "Disruption of overlapping transcripts in the ROSA bgeo 26 gene trap strain leads to widespread expression of b-galactosidase in mouse embryos and hematopoietic cells", PROC. NATL. ACAD. SCI. USA, vol. 94, 1997, pages 3789 - 3794
- ZHU, D. ET AL.: "Deregulated expression of the Myc cellular oncogene drives development of mouse "Burkitt-like" lymphomas from naive B cells", BLOOD, vol. 105, 2005, pages 2135 - 2137

Citation (search report)

- [E] WO 2009032194 A1 20090312 - WHITEHEAD BIOMEDICAL INST [US], et al
- [Y] HUAFENG XIE ET AL: "Stepwise Reprogramming of B Cells into Macrophages", CELL, vol. 117, no. 5, 28 March 2004 (2004-03-28), Amsterdam NL, pages 663 - 676, XP055728800, ISSN: 0092-8674, DOI: 10.1016/S0092-8674(04)00419-2
- [Y] SUH HYUNG-CHAN ET AL: "CCAAT Enhancer Binding Protein-[alpha] (C/EBP[alpha]) Determines Myeloid Versus Erythroid Cell Fate in Multipotential Progenitors", BLOOD, AMERICAN SOCIETY OF HEMATOLOGY, US, vol. 104, no. 11, 16 November 2004 (2004-11-16), pages 1603, XP086655144, ISSN: 0006-4971, DOI: 10.1182/BLOOD.V104.11.1603.1603
- [Y] IWASAKI HIROMI ET AL: "The Ordered Expression of Transcription Factors Directs Hierarchical Lineage Specification of Eosinophils, Basophils and Mast Cells", BLOOD, AMERICAN SOCIETY OF HEMATOLOGY, US, vol. 104, no. 11, 16 November 2004 (2004-11-16), pages 224, XP086656992, ISSN: 0006-4971, DOI: 10.1182/BLOOD.V104.11.224.224
- [Y] CATHERINE V. LAIOSA ET AL: "Reprogramming of Committed T Cell Progenitors to Macrophages and Dendritic Cells by C/EBP[alpha] and PU.1 Transcription Factors", IMMUNITY, vol. 25, no. 5, 1 November 2006 (2006-11-01), AMSTERDAM, NL, pages 731 - 744, XP055422195, ISSN: 1074-7613, DOI: 10.1016/j.immuni.2006.09.011
- [T] JACOB HANNA ET AL: "Direct reprogramming of terminally differentiated mature B lymphocytes to pluripotency", NIH PUBLIC ACCESS AUTHOR MANUSCRIPT, 18 April 2008 (2008-04-18), pages 1 - 23, XP055482309, DOI: 10.1016/j.cell.2008.03.028
- [T] C BUENO ET AL: "Reprogramming human B cells into induced pluripotent stem cells and its enhancement by C/EBP[alpha]", LEUKEMIA, vol. 30, no. 3, 26 October 2015 (2015-10-26), London, pages 674 - 682, XP055534951, ISSN: 0887-6924, DOI: 10.1038/leu.2015.294
- [XPY] J. YU ET AL: "Induced Pluripotent Stem Cell Lines Derived from Human Somatic Cells", SCIENCE, vol. 318, no. 5858, 21 December 2007 (2007-12-21), pages 1917 - 1920, XP055178042, ISSN: 0036-8075, DOI: 10.1126/science.1151526
- [XPY] MASATO NAKAGAWA ET AL: "Generation of induced pluripotent stem cells without Myc from mouse and human fibroblasts", NATURE BIOTECHNOLOGY, GALE GROUP INC, NEW YORK, vol. 26, no. 1, 30 November 2008 (2008-11-30), pages 101 - 106, XP008153586, ISSN: 1087-0156, DOI: 10.1038/NBT1374
- [XPY] WERNIG MARIUS ET AL: "c-Myc is dispensable for direct reprogramming of mouse fibroblasts", CELL STEM CELL, ELSEVIER, CELL PRESS, AMSTERDAM, NL, vol. 2, no. 1, 1 January 2008 (2008-01-01), pages 10 - 12, XP009098390, ISSN: 1934-5909

Citation (examination)

KAZUTOSHI TAKAHASHI ET AL: "Induction of Pluripotent Stem Cells from Mouse Embryonic and Adult Fibroblast Cultures by Defined Factors", CELL, ELSEVIER, AMSTERDAM NL, vol. 126, no. 4, 25 August 2006 (2006-08-25), pages 663 - 676, XP008157317, ISSN: 0092-8674, DOI: 10.1016/J.CELL.2006.07.024

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DOCDB simple family (application)

US 2008004516 W 20080407; AU 2008236629 A 20080407; CA 2683056 A 20080407; CA 3071055 A 20080407; CN 200880015182 A 20080407; CN 201610213311 A 20080407; EP 08742630 A 20080407; EP 12003893 A 20080407; EP 21162420 A 20080407; JP 2010502158 A 20080407; JP 2014251545 A 20141212; JP 2016221842 A 20161114; JP 2018027715 A 20180220; JP 2019183743 A 20191004; JP 2019183744 A 20191004; JP 2021204107 A 20211216; JP 2024000151 A 20240104; MX 2009010847 A 20080407; MX 2015009872 A 20080407; RU 2009140903 A 20080407; US 201414473250 A 20140829; US 201715607028 A 20170526; US 201816147003 A 20180928; US 59504108 A 20080407